#### <u>Final</u> Minutes of IHRA Steering Committee Meeting #11 Thursday and Friday; May 9 and 10, 2002 Room 4440

# 400 7<sup>th</sup> Street, SW Washington, DC 20590 U.S.A.

**Attendance** 

Australia Keith Seyer Canada Ian Noy

EC Per-Ove Engelbrecht

EEVC Bernd Friedel France Dominique Cesari

Germany Hungary Italy

Japan Masahiko Naito

Yoshiyuki Mizuno Takashi Hirai

Seiichi Sugiura (ESV) Kaneo Hiramatsu (ESV)

Poland Wojciech Przybylski

Sweden Anders Lie

The Netherlands

United Kingdom Peter O'Reilly

John Jeyes

Richard Lowne

United States Raymond Owings

Joseph Kanianthra August Burgett William Hollowell Rolf Eppinger Bruce Donnelly Donna Gilmore John Hinch

#### **AGENDA**

Thursday, May 9, 2002

Welcome (Owings)

Side Impact Working Group Presentation (Keith Seyer)

Frontal/Compatibility Working Group Presentation (Peter O'Reilly)

Lunch

Biomechanics Working Group Presentation (Rolf Eppinger)

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18<sup>th</sup> ESV Conference Discussion (Kaneo Hiramatsu, Seiichi Sugiura, Donna Gilmore, Ray Owings)

Adjourn

#### Friday, May 10, 2002

Pedestrian Safety Working Group Presentation (Yoshiyuki Mizuno) ITS Working Group Presentation (Ian Noy) Lunch Steering Committee Meeting Adjourn

#### **IHRA Meeting Minutes**

May 9, 2002

#### 1 – Review of Ray's slides

Ray Owings called the meeting to order at 8:50. He welcomed everyone to Washington DC and reviewed the plans for the upcoming two-day meeting. A copy of his presentation is found in **Attachment 1**.

#### 2 – Keith Seyer – Side Impact

Keith Seyer reviewed the activities of the Side Impact Working Group (WG). His slides are found in **Attachment 2**.

Following the presentation, the Steering Committee (SC) discussed the progress and future actions for the Side Impact WG. Keith Seyer reported that the WG had developed two strategies – a single test approach and a two-tier test protocol, which included a moving deformable barrier (MDB) representing the passenger car fleet and another MBD representing the fleet of heavier light trucks and vans. The SC generally agreed to this approach, but there was some discussion regarding the desirability for countries who have the diverse fleet of passenger cars and heavier light vehicles to substitute the MDB representing the heavier light vehicles to address safety in passenger cars and the heavier light vehicles.

#### 3 – Peter O'Reilly – Frontal/Compatibility

Peter O'Reilly gave a presentation on the progress of the Frontal/Compatibility WG, including the terms of reference. A copy of the presentation is found in **Attachment 3**.

The SC was interested in NHTSA's rulemaking effort related to frontal compatibility. NHTSA indicated that it could not discuss rulemaking decisions. After an open round of discussion, the SC indicated that the WG should continue ahead with the goal to harmonize the standards realizing that NHTSA rulemaking responsibilities rests with the Office of Safety Performance Standards and not the Office of Research..

#### 4 – Rolf Eppinger – Biomechanics

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<u>Final Minutes of IHRA Steering Committee</u> (SC) Meeting #11 Thursday and Friday; May 9 and 10, 2002

Rolf Eppinger gave a presentation discussing several of the Biomechanics WG's efforts. A copy of the presentation is found in **Attachment 4**. The presentation included the status of the side impact research paper the SC requested at the 16<sup>th</sup> ESV conference.

There were no decisions or directions given to the Biomechanics WG as a result of the presentation.

During the SC meeting, this subject was raised again, and the SC agreed that the Biomechanics WG should concentrate on side and frontal dummies and their proposed white paper prior to starting new biomechanical efforts related to child and rear impact dummies.

#### 5 – ESV Discussion – JNOC and NHTSA

Two presentations were made regarding ESV. The first was made by Seiichi Sugiura, JNOC Chairman, and Kaneo Hiramatsu of JARI, a member of JNOC. A copy of their presentation is found in **Attachment 5**. Ray Owings made the second presentation regarding ESV. A copy of his presentation is found in **Attachment 6**.

The Government Focal Points (GFP) requested that JNOC send 200 copies of the ESV 2<sup>nd</sup> announcement and 50 copies of the Exhibition Information to each participant (EEVC asked for 300 copies of the 2<sup>nd</sup> announcement).

There was a discussion regarding the uniformity of the government status reports. Some of the GFPs felt that guidelines should be established to insure uniformity. After a round of discussion, it was decided to make the reports more standardized and related to the conference. Donna Gilmore, ESV's scientific secretariat, will distribute this information.

There was a request that meeting rooms be made available for the IHRA WGs to convene meetings just prior to, during, or just after the completion of the ESV conference. WGs in need of a meeting room should quickly make a written request to Donna Gilmore.

#### 6 – ESV Session #15 – Joseph Kanianthra

Joseph Kanianthra led a discussion regarding session #15, *International Harmonized Research:* From Research to Regulation, planned for the upcoming ESV. To get the discussion started, Joseph Kanianthra made a presentation – see **Attachment 7**. There was general agreement that this session would be good for IHRA. Joseph Kanianthra proposed the session be set up as a panel, seeking views from industry and government from three main world regions – Asian-Pacific, Europe, and North America.

May 10, 2002

#### 7 – Yoshiyuki Mizuno – Pedestrian Safety

Yoshiyuki Mizuno distributed a draft copy of the Pedestrian Safety WG interim report that reflected their first 5 years of work. He indicated that this would be finalized over the summer.

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Yoshiyuki Mizuno also made a presentation regarding the Pedestrian Safety WG – a copy is found in **Attachment 8**. He also reported that the Pedestrian Safety WG would be making a presentation to GRSP the week following the IHRA meeting.

The SC discussed upcoming pedestrian safety regulations in Japan and regulatory agreements in the EU. There was further discussion of combining the use of active and passive safety systems to as countermeasures to improve pedestrian safety.

#### 8 – ITS – Ian Noy

Ian Noy distributed a set of slides. A copy of his presentation is found in **Attachment 9**.

The ITS WG made a presentation to WP.29 AC2 last year regarding the efforts of the ITS WG. Ian Noy reported that there was general acceptance of the ITS work area and further reported that WP.29 had formed an ad hoc group for ITS. Masahiko Naito is leading the new effort.

#### 9 – Steering Committee Meeting – Ray Owings

#### **Approval of Last meeting minutes**

Several minor typographical corrections were made. Richard Lowne asked that the minutes be changed to clearly reflect the 2-year steps for both the steering committee and working groups. The minutes were approved, as corrected.

Regarding distribution of materials using e-mail, there was some concern within the SC that everyone is not receiving their e-mails. The SC asked the secretary to add a rsvp to all e-mails to make sure they are received. Thus, in the future, all e-mail transactions will have a note at the bottom requesting the recipient to respond that they have received the information. While not discussed at the SC meeting, the secretary will attempt to call or fax SC members who do not rsvp.

#### **Terms of Reference**

The SC Terms of Reference (TofR) were discussed. A couple of minor edits were suggested, including replacing "EEC" with "EC" and changing "WP.29" to read "UN/ECE WP.29."

The individual WGs were polled to determine the current status of their TofRs. The following table provides the status as of the meeting date:

Status of IHRA WG TofR		
WG	Status	
Side Impact	Final	
ITS	Will Mail	
Frontal/Compatibility	Final	
Pedestrian Safety	Final	
Biomechanics	Near Final (see note)	

Note: The SC discussed the Biomechanics WG's TofR. The general agreement of the SC was the WG should concentrate on frontal dummies, side dummies, and the proposed white paper. Work on rear impact dummies and child dummies should be delayed until frontal and side efforts are completed. Dominique Cesari agreed to report to the Biomechanics WG at their next meeting.

#### **Discussion on ES-2 – Bernd Friedel**

Bernd Friedel provided a short discussion regarding the current status of the ES-2 dummy in Europe based on the EEVC research and recommendations. The SC found his report to be very informative and expressed their thanks for his report.

#### **Event Data Recorder WG Update – Ian Noy**

Ian Noy distributed a handout with an update of the Canadian proposal for the formation of a new WG for event data recorders (EDR). A copy of his handout is provided in **Attachment 10**. Ian Noy noted that several groups were already working on EDRs, including IEEE, SAE, ISO, and NHTSA. The SC discussed the fact that currently there is no real research ongoing in this area, suggesting that most of the current activities are consensus building, and that IHRA could bring fundamental research to the program.

After considerable discussion, the SC decided that an ad hoc group should be set up to explore, in further detail, the IHRA role in EDR harmonized research. At a minimum, the group should develop draft TofR for review at the next SC meeting. Canada, Sweden, France, and the U.S. expressed interest in working on the ad hoc group and Canada agreed to take the lead.

#### Linkage with WP.29

About a year ago, the SC made a presentation to WP.29 regarding the IHRA efforts. As part of that effort, the SC asked each IHRA WG to give a research status report to one of the UN/ECE WP.29 GRs. The status of the assignment was reviewed. The following table provides the status of the assignment.

Status of WG reports to WP.29 GRs		
WG	Completion Date/Status	
Side Impact	December 2001	
ITS	WP.29 and AC2 (Need date)	
Frontal	December 2001	
Compatibility	December 2001	
Pedestrian Safety	Planned for May 2002	
Biomechanics	Not planned as of this meeting. WG will	
	discuss at their next meeting	

#### Web page

John Hinch briefed the SC on the progress of the IHRA web page. He indicated that several WGs had provided information, but minutes are still needed for Advanced Frontal and

Biomechanics WGs. Several SC members agreed to assist the secretary in obtaining copies of the outstanding minutes.

#### **Next meeting**

It was agreed by the SC to hold the next meeting on Sunday, May 18, 2003, in Japan at the ESV Conference. The meeting will commence around noon local time with a light lunch followed by the business meeting. Main topics for the next meeting include: EDR ad hoc group report, WG reports, and SC decision on how to continue IHRA. Attendees should plan for a 18:00 adjournment.

The meeting was adjourned around 15:00

#### End of Report

Minutes prepared by John Hinch

NHTSA

Drafted: May 15, 2002 Updated: June 2003

#### Attachments

- 1 Ray Owings' Introductory Slides
- 2 Keith Seyer's Side Impact Slides
- 3 Peter O'Reilly's Frontal/Compatibility Slides
- 4 Rolf Eppinger's Biomechanics Slides
- 5 Seiichi Sugiura and Kaneo Hiramatsu's ESV Slides
- 6 Ray Owings' ESV Slides
- 7 Joseph Kanianthra's ESV Session #15 Slides
- 8 Yoshiyuki Mizuno's Pedestrian Safety Slides
- 9 Ian Noy's ITS Slides
- 10 Ian Noy's EDR Slides

# International Harmonized Research Activities

May, 2002

# IHRA Steering Committee Meeting 11

# Purpose of Meeting

- Technical Presentations by the 5 Working Groups
- New and Old Business of the Steering Committee
- Prepare for ESV 18

## Agenda

#### Thursday, May 9, 2002

- 8:50 Welcome
- 9:00 Side Impact Working Group
- 11:00 Frontal/Compatibility Working Group
   13:00 Lunch (provided in meeting room)
- 14:00 Biomechanics Working Group
- 16:00 18th ESV Conference Discussion
- 18:30 Dinner

# Agenda (continued)

#### Friday, May 10, 2002

- 8:30 Welcome (coffee)
- 9:00 Pedestrian Safety Working Group
- 11:00 ITS Working Group Presentation
- 13:00 Lunch (provided in meeting room)
- 14:00 Steering Committee Meeting
- 18:00 Adjourn

## Steering Committee Agenda

(Hinch)

 Approval of previous minutes Finalization of SC Terms of Reference (Owings) Review of 5 Working Group Presentations and Terms of Reference (Owings) EDR Working Group Update from Canada (Noy)

 Update on ES2 (Friedel)

Status of WG Presentations to the

 WP29 GRs (WG chair persons)

 IHRA Web Page Update (Hinch)

 New Business Items (Owings)

(Owings) Next Steering Committee Meeting

#### International Harmonized Research Activities

- Genesis 15th Enhanced Safety Of Vehicles Conference - in 1996
- Developed by ESV Government Focal Point
- Address Some of the Major Issues of Highway **Safety By Harmonized Research Activities**
- Initial Period 5 Years
- Extended to 7 Years in 2001

# Why an International Harmonized Research Agenda?

- Improved Safety Benefits Worldwide
- Injuries Are Universal in Nature
- Globalization of an Industry That Is Affected by Motor Vehicle Regulations
- Shrinking Research Dollars and Fewer Experts in the Field

#### Process

- All Participating ESV Countries/organizations
   Will Participate in Conducting Research on the Research Priorities.
- ► The ESV Government Focal Points Will Form the a Permanent Working Group to Coordinate and Follow the IHRA Activities.

## Lead County Responsibilities

- ► Summary of Current Knowledge Report
- Develop a Plan Which Includes Research Objectives and End Product
  - -- Identify Tasks Involved
  - -- Identify Which Countries Will Perform Which Tasks
  - -- Identify Data Collection Needs
- ► Identify Resources Needed, Establish Milestones and Establish Review Procedures
- ► Assumes Responsibility for Administrative Process Gathering of Information

## IHRA Organization

WWW-IHRA.NHTSA.DOT.GOV

#### • Steering Committee

- Government Representatives
- -Chaired by NHTSA

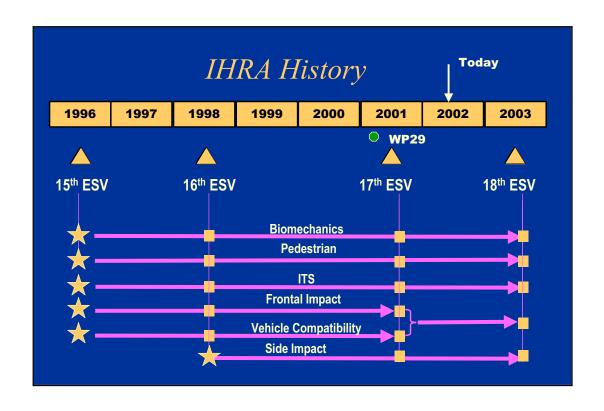
#### Working Groups

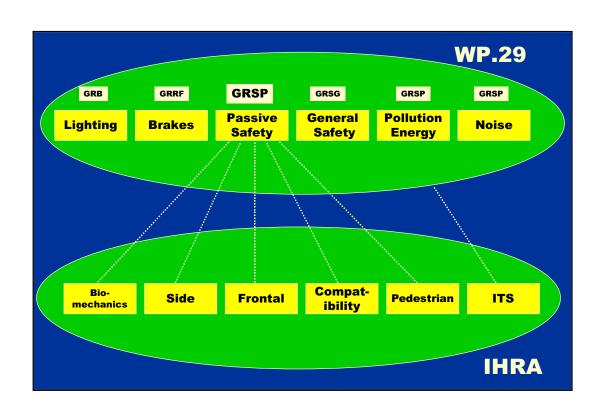
Government and Industry RepresentativesParticipate

# IHRA Industry Participation

- Each Working Group Has 3 Regional Industry Representatives
- Geographical Locations
  - Asia/Pacific
  - European
  - North America
- Selected by <u>OICA</u>
- At Chairman's Discretion Other Experts Invited As Necessary

IHRA Steering Committee Members					
<u>Australia</u>	Keith Seyer	<u>Japan</u>	Masahiko Naito		
<u>Canada</u>	lan Noy	Yoshiyuki Mizuno			
ECE	Per-Ove Engelbrecht	The Netherla	nds Kees Doornheim		
<u>EEVC</u>	Bernd Friedel	<u>Poland</u>	Wojciech Przbylski		
<u>France</u>	Bernard Gauvin Dominique Cesari	<u>Sweden</u>	Anders Lie		
<u>Germany</u>	K-L Lenz	<u>U.K.</u>	Peter O'Reilly		
<u>Hungary</u>	Sandor Szabo		John Jeyes Richard Lowne		
<u>ltaly</u>	Antonio Erario	<u>U.S.</u>	Ray Owings Joseph Kanianthra John Hinch		





# IHRA Side Impact Working Group Status Report

May 2002





# Outline

- 1st term outcome
- New Terms of Reference
- Timeframe of work
- Liaison with other groups
- Summary of progress over past year
- Future research



## First Term Outcome

- 4-part test procedure required:
  - Mobile Deformable Barrier to vehicle test
  - Vehicle to pole test
  - Out-of-position side airbag evaluation
  - Sub-systems head impact test



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# Meetings

- 12th 14/15 June 2001 Lyon
- 13th 7/8 December 2001 Geneva
- 14th 21/22 February 2002 Melbourne
- Minutes on website www-ihra.nhtsa.dot.gov



## New Terms of Reference

- Objective the same
  - Co-ordinate research worldwide to support the development of future side impact test procedure(s) to maximise harmonisation with the objective of enhancing safety in real world side crashes.



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# Scope

- Coordinate research to draft and evaluate test procedures identified in its 1st term
- Coordinate research to examine the feasibility of improving side impact protection for occupants on the non-struck side and develop a test procedure to evaluate such protection.



## SIWG Activities

- Review new real world crash data to prioritise injury mechanisms and identify associated crash conditions taking into account likely future trends.
- Take into account the need to protect both front seat and rear seat(s) adult and child occupants.



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#### SIWG Activities

- Interact with the IHRA Biomechanics Working Group to monitor the development of harmonised injury criteria.
- Interact with the IHRA offset frontal and vehicle compatibility working groups to ensure solutions in one area do not degrade safety in another.



### SIWG Activities

- Monitor and, as appropriate, provide input to the development of WorldSID and any other side impact dummy.
- Determine the greatest degree of harmonisation feasible and the design and vehicle safety performance implications of adopting different levels of test severity or the worst t case condition.



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## SIWG Activities

• Coordinate the evaluation of proposed test procedures subject to availability of test dummies and injury criteria.



## Timeframe

- Target date for draft final proposal of test procedure(s) is 2003 ESV
- Target date for final proposal of test procedure(s) is 2005 ESV with validation in the intervening 2 years.



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## Liaison with WP29

 Prior to the 13<sup>th</sup> meeting of the SIWG in December 2001, the group's 1st term work was presented to the Expert Group on Passive Safety (GRSP) in Geneva.



# WorldSID Progress

- JAMA Evaluation and NHTSA testing is scheduled for the 2<sup>nd</sup> and 3rd quarters of 2002
- Pre-production prototypes available beginning October 2002



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# WorldSID Progress

- Worldwide regulatory bodies, OEMs, suppliers, and researchers to evaluate preproduction dummies
- Production dummies available 1st Quarter 2004
- 50th %ile male dummy is regulation-ready 1st Quarter 2004



# WorldSID Progress

- 50% male WorldSID regulation ready for pole test
- SIWG requested ISO for development of 5% female WorldSID
- May have to list SID IIs as dummy to be used for MDB test

- unless IHRA BWG advised otherwise



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## **Accident Studies**

- US fatal data shows struck vehicle is predominantly a passenger car and that pickups and SUVs were over-represented as striking vehicles.
- Crabbed and perpendicular impacts were equally common in US.



## Fleet Studies

- Passenger compartment size tapers off to limiting against wheelbase
- Wheelbase alone may not be good surrogate for compartment size
- H-point location relative to wheelbase better
- Worse case structural interaction also to be considered



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# **Drafting Test Procedures**

- Mobile Deformable Barrier Test Australia
- Pole Impact Test USA
- Interior Headform Test EEVC
- OOP and airbag interaction Test Canada



### Mobile Deformable Barrier Test

- Remains most challenging task for the group
- If IIHS proceeds with publishing consumer results using its new MDB, may become de facto regulation in North America
- EEVC also working on new MDB face
  - to mirror intrusion profiles seen in real world
     European crashes



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# MDB Test - Agreed Points

- Longitudinal impact velocity component of 50 km/h
- Small adult female driver dummy.
- Seatbelts applied



### MDB Test - Main Issues

- Need for rear dummy?
- Crabbed or perpendicular test?
- Barrier element homogeneous or not?
- Stiffness distribution of barrier element?
- Mass of trolley?
- Ground clearance of barrier?
- Non-struck side test?



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# MDB Test -Stiffness/Homogeneity

- Stiffness distribution determines intrusion profile shape
- Are current elements representative of current fleets?
- Is only initial stiffness important?
  - little crush of bullet vehicle
  - issue for compatibility



#### MDB Test - Kerb Mass

- European/Japanese fleet average mass of passenger cars is 1150-1200 kg
- US passenger car fleet 1415 kg
- US LTV fleet 1920 kg
- US Pass car/LTV fleet 1635 kg
- Europe may consider 1500 kg
   US and Japan undecided



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### MDB Test - Ground Clearance

- US want something representative of LTVs
   perhaps 450 mm
- Rest of world will consider 350 mm
- Perhaps 350 mm ground clearance plus mandating design feature such as "blocker beams" in LTVs?
- Perhaps a worst case criteria?



## Pole Test

- Moving vehicle to pole test
- Perpendicular impact
- Impact speed 30 km/h
- Evaluate head and thorax(at least)
- Mid size male
- Rigid pole [350 mm] [FMVSS 201 = 254 mm]
  - try to load head and thorax simultaneously



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# Out-of-position side airbag evaluation

- ISO TR 14933, NHTSA and Transport Canada and IIHS research
- NHTSA and Transport Canada to review current research



## **Interior Headform Test**

- Based on FMVSS 201 and new research from EEVC
- EEVC research to date confirms many aspects of FMVSS 201 test procedure
- Proposal to compare draft EEVC test procedure with FMVSS 201 to check for differences that might impede harmonisation.



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# Non-Struck Side Impacts

- DOTARS, GM-Holden's, Monash Uni and Wayne State joint project to investigate non-struck side injuries
- Recent test comparing WorldSID (decoupled spine) with PMHS showed similar kinematics.



### Future Research

- Understand that IHRA is about coordinating harmonised research
- However, it is easier to focus on required research if desired regulatory outcomes are known
  - particularly if regional fleet dictates additional test requirements (eg SUVs)
- Seek guidance from SC's government regulators on this issue



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### **Future Research**

- Determine the degree of harmonisation possible in the MDB test including examination of:
  - a worst case test using an MDB resembling an SUV or,
  - an MDB resembling a passenger car + an MDB resembling an SUV
    - additional test only for those countries with large SUV population



## **Future Research**

- Further research to define the test parameters of the MDB test
- How the MDB test, pole test and interior sub-systems test are likely to affect vehicle design to try and eliminate redundant tests to reduce the burden of testing
  - in validation phase





# REPORT TO IHRA STEERING GROUP - MAY 2002

Peter O'Reilly

DETR (UK), Chairman of IHRA

Vehicle Compatibility and Frontal

Impact WG

## **WG Aims**

- Improve occupant protection by developing internationally agreed test procedures to improve the compatibility of car structures in front to front and front to side impacts
  - Secondary aim to consider protection in impacts with pedestrians, heavy goods vehicles and other obstacles
  - New draft TOR to reflect frontal impact

# **Participants**

- Scientific members representing governments in Europe, USA, Japan, Australia and Canada
- Representatives of industry in USA,
   Japan and Europe
- Many have own programmes or resources e.g. USA, Japan, Australia, Europe (EEVC, national, EUCAR)
- Front membership still settling in

### **WG** - Activities

- First Compatibility WG meeting June 1997
- Three meetings since ESV2001
- EEVC and Australian research links in these
- Reports to GRSP (frontal and compatibility)
- Workshop planned
- Current focus has continued to be on compatibility
- Links with other research programmes

# Work plan

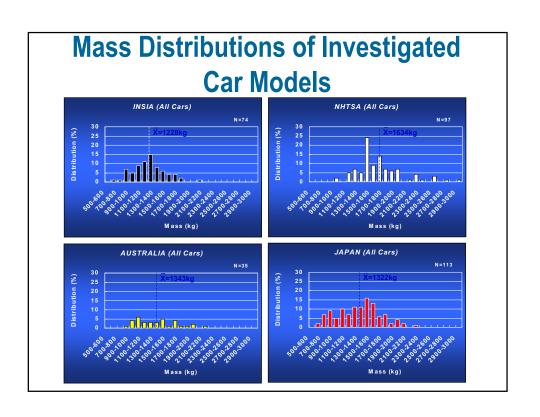
- Problem definition
- Determine key characteristics
- Assessment methods

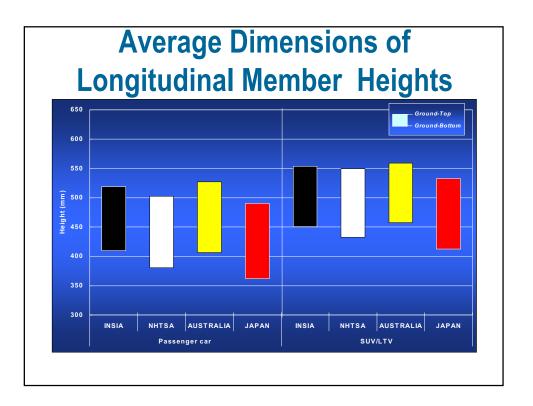
# **Research Approaches**

- Analyses fleet, accident and structural
- Vehicle to vehicle crash tests -front and side
- Vehicle to Barrier tests (fixed barrier)
- Vehicle to barrier (load cell wall)
- Vehicle to MDB
- Overload/compartment strength testing
- Models FE and MADYMO
- Fleet model

# **Fleet Composition**

- LTV/SUVs
  - USA, Canada high presence and rising
  - Australia intermediate
  - Europe and Japan low
- Mass (broad sources)
  - Midsize US car group 1360-1590kg (+400kg LTV)
  - Japan/Europe 1150/1200kg
- Overview of regional car measurement surveys
  - structural members have similar dimensions
  - US models +300kg
  - some more data needed





# **Accident Analysis**

- Broad national data
  - mass but other effects may be present and not disentangled
  - LTVs relatively more aggressive geometry and stiffness
- More detailed data
  - Examples of poor compatibility often found
  - Intrusion significant injury factor
- Research to continue (including in-depth)
- Will help support later cost benefit estimates

# **Vehicle testing (front)**

- Examples of poor interaction, in particular over-riding; inefficient use of energy absorbing structure
- Better frontal connections help
- Link injury criteria in struck vehicle and aggressivity metric of striking vehicle

# **Broad position**

- Compatibility not "simply mass"
- Geometry and stiffness are at work
- Examples of poor structural interaction often found
- Intrusion fatal and serious injuries

# **Barrier** (fixed) testing

- Full width barrier with load cells hypothesis: good homogeneity will lead to improved structural interaction
- OBD load cell data
- Interpretation of data: potential criteria AHOF, analysis of variations, others, footprint
- Shear Progressive Deformable Barrier PDB, two approaches constant speed, constant energy

# **MDB** testing

- NHTSA: allows best overall coverage of US accidents - desire to include frontal crash protection and compatibility
  - not fundamentally opposed to fixed barrier if equivalent protection
- Some issues/concerns: over-riding, repeatability, configurations

### Overload/compartment strength tests

- Severe test aimed only at assessing passenger compartment strength
- Two avenues explored
  - using previously impacted car
    - results unrealistic
  - using new car
    - severe test; no or minimal criteria
    - failure modes, repeatability
    - evidence at lower speed?

### **Relevant aspects - frontal**

- Good structural interaction
- Maintain passenger compartment integrity
- Predictable performance of structure
- Control deceleration time histories

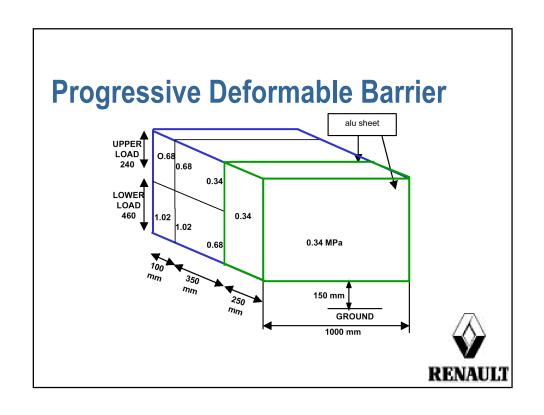
### **Possible Front Test Procedures**

- Full width frontal barrier with load cells (with or without deformable element?)
- Offset Deformable Barrier ODB with load cells
- Overload/compartment strength test ODB (compartment integrity)
- Barrier elements to explore shear PDB (two approaches (constant speed, constant energy)
- Mobile deformable barrier (various)

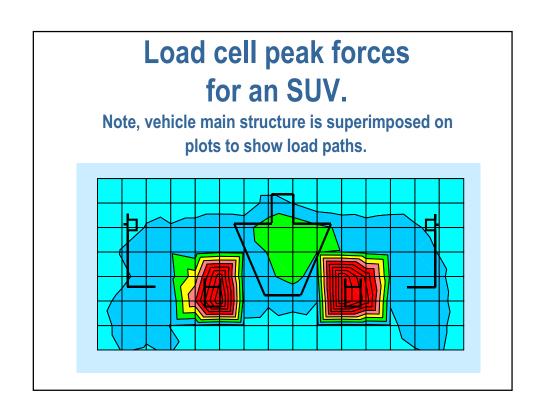
### **Full Deformable Barrier**









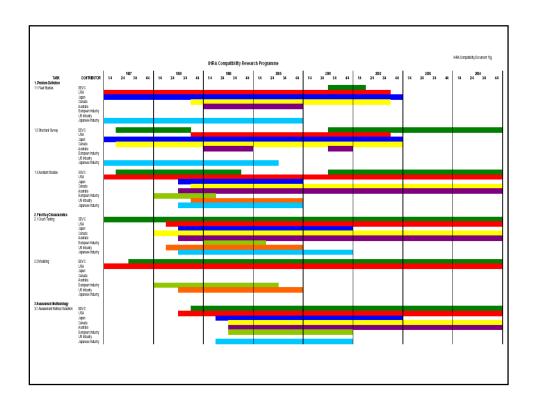


### Focus on frontal compatibility tests

- Nothing ruled out
- Appreciable effort being made on development of test approaches
- Interpretation of results

### **Possible Side Test Procedures**

- Side remains complex
- Frontal proposals that encourage homogeneity and good interaction with sill/ side pillars likely to help
- Key elements affecting aggressivity known
  - geometry greatest
  - vertical intrusion profile
  - stiffness distribution of bullet vehicle (initial)
  - promoting sill engagement
  - distributed loading of occupant
- Currently difficult to define envelope of desirable vehicle (front) characteristics (first 100mm?)



### Issues (Research/ technical)

- Unified approach required for benefits
- Improving understanding/ interpretation of test data for good structural interaction
- Deviations from existing frontal test(s)?
- Choice of procedure(s)
- Define outline and detail of test procedures and key criteria (research, then evaluation)
- Definition of an MDB test, if it were to be an international approach
- Mechanisms to support choice(s)
- Progress very dependent on continued research
- Others

### **More General Issues**

- Effective forum early interaction
- Rely on research work of Members
- Different regional emphases and phasing but much in common
- Focus on technical/ fleet aspects
- Emphasis on key elements and increasingly on potential test procedures
- Industry involvement has been healthy

### **Other**

- NHTSA potential rule making reduced time frame
- Workshops
- Data compilation/overviews
- Website

### **To Conclude**

- Test procedures achievable for front, side some way off
- Improved front structural interaction beneficial in itself and a pre-requisite
- Range of tests are candidates choice
- Compatibility issues can arise in all impacts
- US rule making opportunity or challenge
- Staged approach is possible

### **THANK YOU**

Co-operation and contributions from all in IHRA group are gratefully acknowledged.

### STATUS REPORT OF THE BIOMECHANICS WORKING GROUP

PRESENTED TO THE IHRA STEERING COMMITTEE

May 9, 2002

WASHINGTON, D.C.

### INTERNATIONAL HARMONIZED RESEARCH ACTIVITIES

### MEMBERSHIP:

ROLF EPPINGER
DOMINIQUE CESARI
DAINIUS DALMOTAS
KOSHIRO ONO
KEITH SEYER

JAC WISMANS HAROLD MERTZ FARID BENDJELLAL

FUMIO MATSUOKA

CHAIRMAN, NHTSA, USA

**INRETS/EU** 

TRANSPORT CANADA

JARI, JAPAN

**DEPT OF TRANSPORT, AUSTRALIA** 

TNO/EU

OICA, NORTH AMERICA

OICA, EU

OICA, ASIA-PACIFIC

# RECENT MEETINGS: JUNE, 2001 AMSTERDAM NOVEMBER, 2001 SAN ANTONIO MARCH, 2002 ANN ARBOR

# INTERNATIONAL HARMONIZED RESEARCH ACTIVITIES NEW TERMS OF REFERENCE MISSION AND OBJECTIVES COORDINATE WORLDWIDE BIOMECHANICAL RESEARCH EFFORTS. DEVELOP AND DOCUMENT TECHNICAL BASIS FOR CREATING A WORLDWIDE, HARMONIZED, FAMILY OF ANTHROPOMORPHIC TEST DEVICES WITH ASSOCIATED INJURY CRITERIA AND PERFORMANCE LIMITS. PROVIDE BIOMECHANICAL EXPERTISE TO OTHER IHRA GROUPS.

### **NEW TERMS OF REFERENCE**

### SCOPE:

THE EFFORTS OF THE BWG SHALL ENTAIL BUT NOT NECESSARILY BE LIMITED TO:

- ANALYZE AVAILABLE WORLDWIDE CRASH DATA TO QUANTIFY THE TYPE AND SEVERITY OF INJURIES RESULTING FROM EACH SIGNIFICANT CRASH MODE.
- IDENTIFY, ANALYZE, AND OPTIMIZE MEANINGFUL INJURY FUNCTIONS THAT ADDRESS THE ABOVE-IDENTIFIED INJURIES.
- REVIEW ALL AVAILABLE BIOMECHANICAL IMPACT RESPONSE DATA TO DETERMINE BOTH NECESSARY AND SUFFICIENT SPECIFICATIONS TO APPROPRIATELY CHARACTERIZE AND VERIFY A TEST DEVICE'S BIOFIDELITY.

### INTERNATIONAL HARMONIZED RESEARCH ACTIVITIES

### **NEW TERMS OF REFERENCE**

### SCOPE (CON'T):

- EXAMINE AVAILABLE TESTS DEVICES WITH REGARD TO THEIR BIOFIDELITY AND INJURY RISK ASSESSMENT CAPABILITIES AND EITHER RECOMMEND AS EXISTING DEVICE AS APPROPRIATE OR SUGGEST AND EXECUTE REFINEMENTS NECESSARY TO UPGRADE PERFORMANCE TO AN ACCEPTABLE LEVEL.
- DEVELOP A STRATEGIC PLAN FOR FUTURE BIOMECHANICAL RESEARCH.

### **NEW TERMS OF REFERENCE**

### **ACTION PLAN:**

- COMPLETE CURRENT SIDE IMPACT EFFORTS AND PROVIDE DRAFT FINAL REPORT TO IHRA STEERING COMMITTEE BY DECEMBER 2002.
- INITIATE AND PURSUE EFFORTS TO DEFINE AND DEVELOP REQUIREMENTS FOR ADULT-SIZED WORLD HARMONIZED FRONTAL ANTHROPOMORPHIC TEST DEVICES. WORK PLAN IS TO BE DEVELOPED BY SEPTEMBER 2002. CURRENTLY ANTICIPATED TIME REQUIREMENT IS APPROXIMATELY 2 YEARS FROM DEFINITION AND ASSIGNMENT OF TASKS.

### INTERNATIONAL HARMONIZED RESEARCH ACTIVITIES

### **NEW TERMS OF REFERENCE**

### **ACTION PLAN, (CON'T):**

- REVIEW AND PRIORITIZE FUTURE CHILD DUMMY RESEARCH EFFORTS. WORK PLAN IS TO BE DEVELOPED BY FEBRUARY 2003. CURRENTLY ANTICIPATED TIME REQUIREMENT IS APPROXIMATELY 2 YEARS FROM DEFINITION AND ASSIGNMENT OF TASKS.
- INITIATE AND PURSUE EFFORTS TO DEFINE AND DEVELOP REQUIREMENTS FOR A WORLD HARMONIZED TEST DEVICE FOR REAR IMPACT INJURY EVALUATION AND CONTROL. WORK PLAN IS TO BE DEVELOPED BY JANUARY 2003. CURRENTLY ANTICIPATED TIME REQUIREMENT IS APPROXIMATELY 3 YEARS FROM DEFINITION AND ASSIGNMENT OF TASKS.

4

### **NEW TERMS OF REFERENCE**

### **ACTION PLAN, (CON'T):**

• DEVELOP A WHITE PAPER DISCUSSING FUTURE BIOMECHANICAL NEEDS. FINDINGS WILL BE PRESENTED TO THE IHRA STEERING COMMITTEE IN THE FORM OF INTERIM REPORTS DEVELOPED CONCURRENTLY WITH COMMITTEE ACTIVITIES. THE INTENTION IS TO CREATE A LIVING DOCUMENT THAT DOCUMENTS AND TO THE EXTENT POSSIBLE PRIORITIZES AREAS OF BIOMECHANICAL RESEARCH REQUIRING ATTENTION.

### INTERNATIONAL HARMONIZED RESEARCH ACTIVITIES

### **NEW TERMS OF REFERENCE**

### **MEETINGS:**

• CONDUCT QUARTERLY MEETINGS AT VARIOUS VENUES TO ALLOW PARTICIPATING EXPERTS AMPLE AND OPEN DISCUSSIONS TO ARRIVE AT TECHNICAL CONSENSUS

### **NEW TERMS OF REFERENCE**

### **PROPOSED DELIVERABLES:**

- DRAFT FINAL REPORT ON SIDE IMPACT TEST DUMMY- DEC, 2002
- DRAFT INTERIM REPORT ON FRONTAL TEST DUMMY-DEC, 2003
- DRAFT INTERIM REPORT ON CHILD TEST DUMMIES- MARCH, 2004
- DRAFT INTERIM REPORT ON REAR IMPACT TEST DUMMY- MARCH, 2004
- DRAFT INTERIM WHILE PAPER MAY 2003 (IN TIME FOR ESV)

### INTERNATIONAL HARMONIZED RESEARCH ACTIVITIES

### SIDE IMPACT REPORT

### TITLE:

### CONSIDERATION AND SPECIFICATION FOR A UNIVERSAL SIDE IMPACT DUMMY

### **CONTENTS:**

- 1. INTRODUCTION
- 2. CONSIDERATIONS AND SPECIFICATIONS
  - 1. DEFINITIONS OF WORLD-WIDE SIDE IMPACT CRASH PROBLEM
  - 2. ANTHROPOMETRIC CHARACTERIZATION OF CRASH VICTIMS.
  - 3. BIOFIDELIC IMPACT RESPONSE SPECIFICATIONS
  - 4. TEST DUMMY EVALUATION METHODOLOGIES
  - 5. INJURY CRITERIA AND ASSOCIATED PERFORMANCE LIMITS
- 3. DISCUSSION
- 4. ACKNOWLEDGMENTS

### CRASH TEST DUMMY EVALUATION

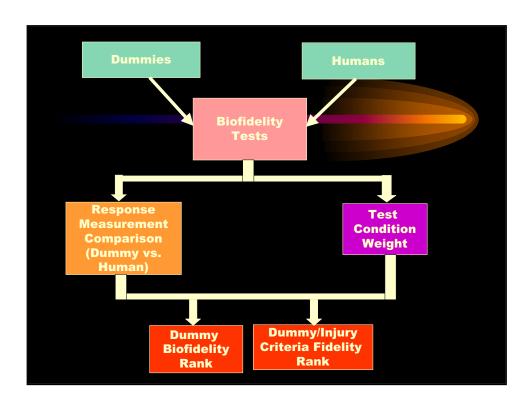
Two issues must be addressed!

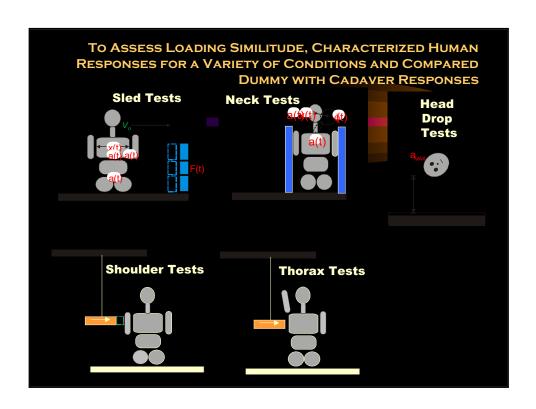
(NECESSARY AND SUFFICIENT CONDITIONS)

- WHAT MUST A DUMMY DO?
- How well does it do these necessary tasks?

### A CRASH DUMMY MUST PERFORM TWO FUNDAMENTAL TASKS:

- LOAD THE CRASH ENVIRONMENT LIKE A
   HUMAN WOULD: I.E., POSSESS IMPACT LOAD
   FIDELITY
- PREDICT HUMAN INJURY CONSEQUENCES: I.E., POSSESS ACCURATE INPUT TO INJURY CRITERIA





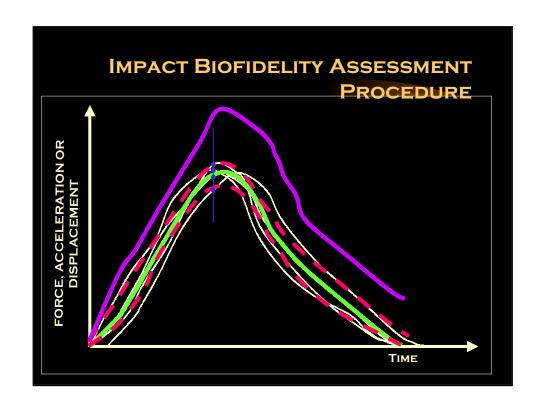
### To Assess Injury Predicting Fidelity, Must Assess Both Predictive Capability of Injury Criteria and Dummy's Ability to Provide

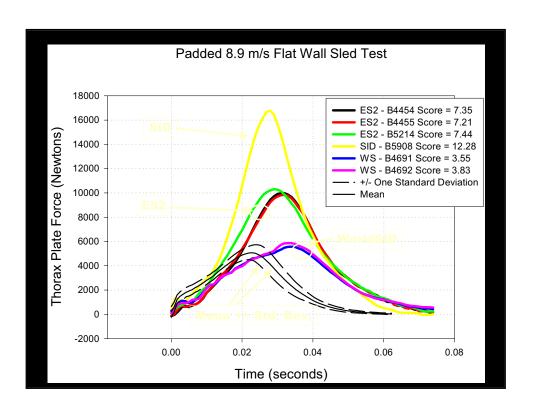
### **ACCURATE RESPONSE INPUT TO CRITERIA**

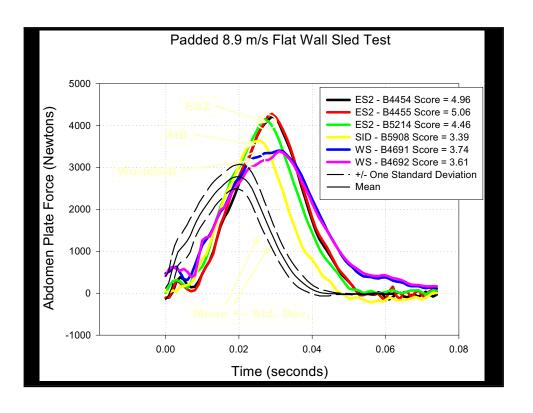
- NECESSARY FOR ONLY THOSE RESPONSES DIRECTLY USED BY THE INJURY PREDICTION FUNCTION.
- OTHER RESPONSES ONLY DESIRABLE BUT NOT NECESSARY.

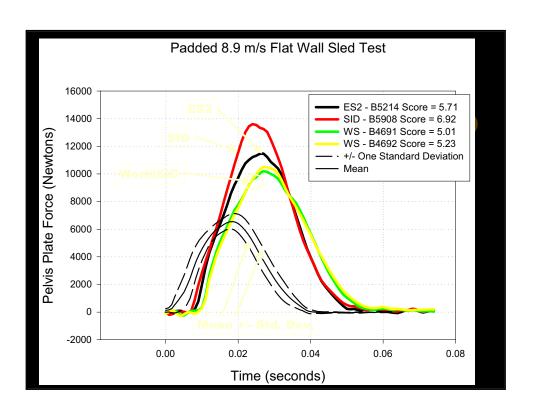
### How is Impact BiofideLity Determined for a Particular Condition?

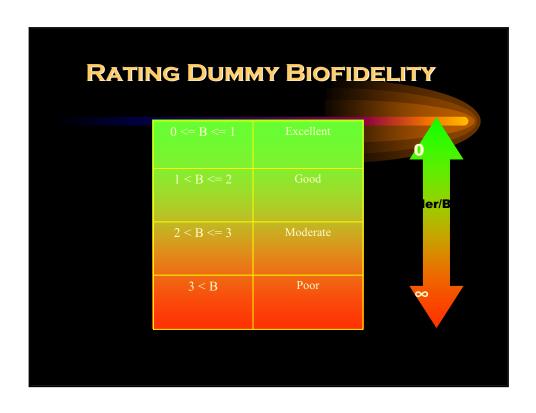
- OVERLAY SPECIFIC RESPONSE FROM REPEATED CADAVER TESTS.
- DETERMINE A MOVING AVERAGE OF RESPONSES OVER TIME
- DETERMINE VARIATION AMONG RESPONSES OVER TIME
- COMPARE CUMULATIVE VARIANCE OF DUMMY RESPONSE FROM CADAVER MEAN TO VARIANCE OF CADAVER RESPONSES FROM CADAVER MEAN.

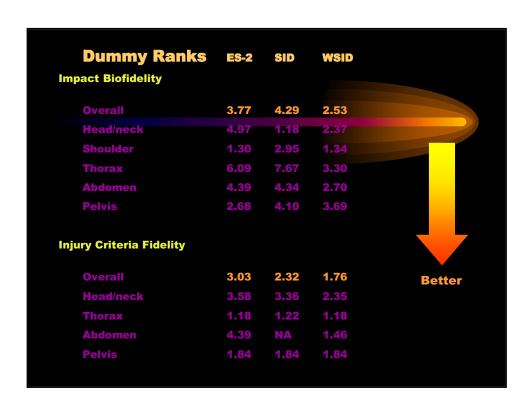








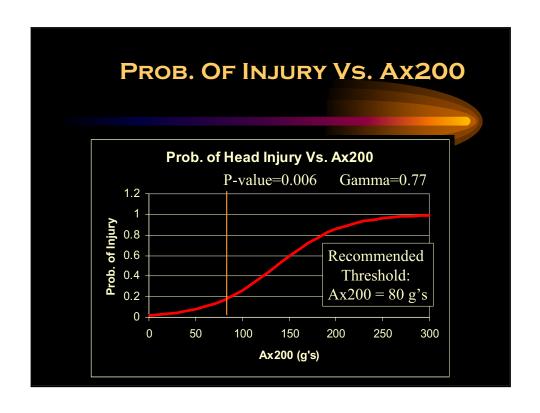




## SIDE IMPACT INJURY CRITERIA

### **HEAD INJURY CRITERIA**

- LATERAL HEAD IMPACT TEST DATA: MCINTOSH, ET AL. (1996) IRCOBI AND ESV PAPERS
- 16 TESTS SKULL FRACTURE AND BRAIN INJURY REPORTED
  - Ax200: RESULTANT HEAD ACCEL. FILTERED TO 200 Hz 3db point
  - HIC1000: UNBOUNDED HIC SAE CLASS 1000



### THORACIC INJURY CRITERIA

- HEIDELBERG TYPE SLED APPARATUS
   WITH LEFT SIDE IMPACT
- 42 SLED TESTS: 15 TESTS AT OSU, 27 TESTS AT MCW — OF THIS DATA, USED 37 TESTS
- UNEMBALMED FRESH AND FROZEN CADAVERIC HUMAN SUBJECTS: INSTRUMENTED WITH ACCELEROMETERS AND CHEST BANDS

### **ANALYSIS OF RESULTS**

Logit of Model (L)	Gamma
-6.45+0.06TTI	0.87
-2.8+0.04*(half thorax defl.)	0.87
-7.57+0.085*(result. spine accel.)	0.9
-8.5+0.055*(half thorax defl.)+ 0.065*(result spine accel.)	0.92

prob. of AIS3 + Injury =  $1/(1 + \exp(-L))$ 

### **DISCUSSION/INITIAL CONCLUSIONS**

 Based on external measurements, bummy biofidelity:

WSIDP > > ES-2 > SIDH3

 BASED ON DUMMY MEASUREMENTS AND INJURY CRITERIA:

THORAX: ALL SAME

ABDOMEN: WSIDP > ES-2; SID - N/A

PELVIS: SID = ES-2 > WSIDP



### **Committees** ■ Organizing Committee: Japan Nagoya Organizing Committee (JNOC) : Chair Mr. Seiichi Sugiura ■ Secretariat: **Japan Nagoya Organizing Committee (JNOC)** c/o Japan Automobile Research Institute (JARI) **■** Review Committee: A review committee will be set-up comprising of 2 scientific experts for each Technical Session They will review abstracts and report their recommendations to the Technical Session Chairperson. ■ Scientific Secretariat: **U.S.Department of Transportation, Research and Development National Highway Traffic Safety Administration** ■ IHRA Secretariat: U.S.Department of Transportation, Research and Development **National Highway Traffic Safety Administration ■ Conference Secretariat:** PROCOM International Co., Ltd.

# Theme and Technical Session Topics "New Steps toward Vehicle Safety Enhancement" "Vehicle Rollover Stability and Rollover Crash Protection "\*Compatibility in Frontal/Side Collisions NCAP Related to Existing Test Procedures Real World Data Acquisition, Injury Risk Assessments and Functional Capacity Metrics Advanced Technology #1 Passive Restraint Systems "\*Biomechanics 1& 2: Injury Criteria and Dummy Development Safety of Heavy Trucks, Buses and Truck Tires "\*Developments in Side Impact Protection "\*Improved Safety for Vulnerable Road Users "\*Advanced Intelligent Technologies-ITS Child Restraint Systems Advanced Technology #2 Driver-Vehicle Safety/Driver Performance Developments in Frontal Impact Protection \*\*IHRA Technical Session Topics

Opening Ceren	nony
■Words of Welcome	9:00 - 9:50
■US Government Awards	10:00 - 10:40
■Government Status Reports - 1	11:00 - 12:00
■Government Status Reports - 2	14:00 - 15:30
■Simultaneous Interpreters for English and German	, Japanese, French
■10 Minutes for Each Government Stat	us Report
Monday, May 19, 2003	9:00-15:30



# Panel Session World-NCAP Tuesday, May 20, 2003 18:00-19:30

### **Panel Session**

International Harmonized Research:
An Experiment in Moving from
Research to Harmonized Regulations

Thursday, May 22, 2003 9:00-12:30

### 2<sup>nd</sup> Announcement and Exhibition Brochure Distribution

- ■To distribute through government focal points
- ■To request Conference Secretariat directly for additionals

**Important Deadline** 

**Submission of Abstracts: September 15, 2002** 

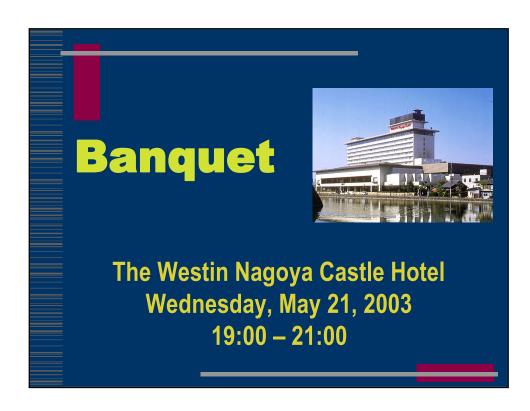
### Registration ■Early Registration Fee: JY 70,000 → Before Feb. 15, 2003 ■Students and Day Registrants Tickets Prepared ■Registration web site → https://secure.procom-i.co.jp/esv2003/regist\_e.html ■FAX: +81-3-3234-4456, E-mail: esv2003@procom-i.co.jp ■Confirmation: A final confirmation sent four weeks prior to ESV2003

Welcome Reception

The Atsuta Shrine
Monday, May 19, 2003
18:30 – 20:00

■Alterations: Should be made in writing before the Conference

Registration Desk Open: Through the conference



### **Technical Visits**

- TOYOTA Tour
- Mitsubishi Motors Tour
- DENSO Tour

Friday, May 23, 2003

### **TOYOTA Tour**

May 23, 2003 10:00-15:00





TOYOTA Motor Corporation is an automobile manufacturer whose head office is in Toyota City, which is located east of Nagoya. Your tour will include visits two places; the TOYOTA KAIKAN Exhibition Hall, located adjacent to TOYOTA's head office, and the TOYOTA Commemorative Museum of Industry and Technology, which is located in Nagoya

Mitsubishi ASV's Development During 2nd ASV Program



### Mitsubishi Motors Tour

May 23, 2003 10:00-15:00

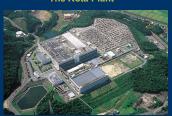
Mitsubishi Motor Corp. operate its Car Research & Development Office and Nagoya Plant-Okazaki in Okazaki City where passenger car are developed and produced.

The Mitsubishi engineering team developed many advanced safety technologies for Advanced Safety Vehicles (ASV) during the 2<sup>nd</sup> ASV program, ASV's have been driven on public roads with special government certification since 2001.

The Kota Plant

### **DENSO Tour**

May 23, 2003 9:00-15:00



DENSO Corporation is a general manufacturer of automobile parts and systems, having 38,000 employee and annual sales of 1,5trillion yen (both figures are non consolidated). Denso mainly produce air-conditioning as fuel-injection system, body-related electronics products such as instrument clusters, safe-driving-related products such as airbag sensors, and information & communication products such as car navigation systems. DENSO supply these products widely to automobile manufactures inside and outside Japan.

# Nagoya Nogakudo Optional Tours Nagoya One Day Tour May 19, 2003 (Mon) Treasure of Inuyama Tour May 19, 2003 (Mon) Mikimoto Pearl Island & Ise Shrine Tour May 20, 2003 (Tue) The Shogun Cultural Tour May 20, 2003 (Tue) Kyoto One Day Tour May 21, 2003 (Wed) Takayama City One Day Tour May 22, 2003 (Thu)

### **Nagoya City**

Nagoya City is a very attractive metropolis with a population of 2,001,500. The base of Nagoya was prepared by leyasu Tokugawa, the founder of Edo Government (1603-1867).

The Nagoya has many aspects, as a historical and cultural city, a center of industry, and base of transportation and accommodation in the Tokai area.

Since Nagoya and its surrounding area form a prosperous industry area, such as auto-mobile and ceramics, it is also an ideal place to make an industrial tour.



Nagoya Castle





## • Technical Program • Technical Session Topics/TSCs • Paper Acceptance Criteria • Schedule - Abstracts/Papers • U.S. Government Awards • Instructions for Nominations (2001) • Awards Process and Deadlines • Dissemination of 2<sup>nd</sup> Announcement

IHRACONFERENCE WASHINGTON DC

# Technical Program Three parallel sessions Tuesday (Morning and Afternoon) Wednesday (Morning and Afternoon) Thursday (Half Day) 14 Sessions + THRA Panel Session

### Technical Session Topics/TSC Vehicle Rollover Stability and Rollover Crash **Protection** Garrott 2. Compatibility in Frontal/Side Collisions \* O'Reilly/ Lowne 3. **NCAP** Related to Existing Test Procedures Rodgers Real World Data Acquisition, Injury Risk Assessments 4. and Functional Capacity Metrics Ono **Advanced Technology #1: Passive Restraint Systems** Lie **Biomechanics 1 Injury Criteria and Dummy Development** \* **Eppinger** \*IHRA Technical Session Topics IHRACONFERENCE WASHINGTON DC

### y 3 Technical Session Topics /TSCs 1. Advanced Technology #2: Driver-Vehicle Safety/Driver performance Friedel 2. **Developments in Side Impact Protection \*** Seyer 3. Improved Safety for Vulnerable Road Users \* Mizuno Advanced Intelligent Technologies-ITS \* 4. Noy 5. **Child Restraint Systems** Wismans **Biomechanics 2 Injury Criteria and Dummy** 6. **Development** Cesari \*IHRA Technical Session Topics IHRA C O N F E R E N C E WASHINGTON DC



### Paper Acceptance Criteria

- Work Must Not Be Previously Published or Presented
- Review Committee: Technical Session Chairs (TSC) Must Have Each Abstract Reviewed by 2 Experts for Comments
- Papers:
  - Oral and Written (154 in the  $17^{th}$  ESV, 210 in  $18^{th}$  ESV )
  - Written Only (69 in the 17<sup>th</sup> ESV, as required)
  - No Poster Presentations (19 in the 17<sup>th</sup> ESV)
- 15 Oral Presentations Per Technical Session (14 minutes per presentation)

  HRACONFERENCE WASHINGTON DC

### Schedule - Abstracts/Papers

- Start Date for Web Site May 15, 2002
- Deadline for Abstract Submission September 15, 2002
- Author notification sent October 21, 2002
- Deadline for Final Paper Submission February 16, 2003
- Deadline for submission of Government Status Reports February 16, 2003

IHRACONFERENCE WASHINGTON DC

## U.S. GOVERNMENT AWARDS

#### • Award Categories

 U.S. Government Award for Safety Engineering Excellence

In recognition of and appreciation for extraordinary scientific contributions in the field of motor vehicle safety engineering and for distinguished service to the motoring public

Special Award of Appreciation

In recognition of and appreciation for outstanding leadership and extraordinary contributions in the field of motor vehicle safety

IHRACONFERENCE WASHINGTON DC

# Instructions for Nominations (2001)

#### Criteria

- A. Demonstrated Scientific Contribution of Valuable Motor Vehicle Safety Research
- B. Demonstrated Impact to Improve the Future of Motor Vehicle Safety Worldwide
- C. Demonstrated Unique and/or Innovative
  Approach Enhancing Motor Vehicle Safety
- D. Demonstrated Applicability of Research or Contribution Within the Past 5 Years

Safety Engineering Award - Criteria A, B, C&D Special Appreciation Award - Criteria C&D Update of these instructions to be provided to GFP

IHRACONFERENCE WASHINGTON DC

## Awards Process and Deadlines

- Each Government Focal Point will submit no more than two nominees for each award category no later than January 6, 2003
- NHTSA will send to GFPs nomination forms and instructions
  - November 1, 2002
- Notification sent to GFPs and nominators February 21, 2003
- Notification sent to award winners
   February 28, 2003

IHRACONFERENCE WASHINGTON DC

## Dissemination of 2nd Announcement

- NHTSA will send out an email to all 17<sup>th</sup> ESV Participants by May 15
- We request allGFPs to distribute and encourage participation in 18<sup>th</sup> ESV Conference

IHRACONFERENCE WASHINGTON DC



# International Harmonized Research: From Research to Regulation

A Panel Discussion On An Experiment in Harmonized Research

## **Objective**



- Show case Achievements in Phase I
- Roles and Expectations of IHRA
- Successes and Failures in Phase I
- Steps for Success
- Where do we go from here?

# Presentation on Side Impact



- Agreements Reached
- Research Completed
- Levels of Harmonization Achievable
- Meeting Safety needs of Various Jurisdictions

## Presentation on Pedestrian Protection



- Agreements Reached
- Research Completed
- Levels of Harmonization Achievable
- Meeting Safety needs of Various Jurisdictions

# Roles and Expectations of IHRA



- Totally Harmonized Standards
- Least common denominator for Performance
- Same Test Device and Injury Metrics
- Same Test Conditions
- Tested Once, Accepted Everywhere

# Successes and Failures of IHRA



- Government View
- Industry View

# Steps for Success



- Clearly Defined Expectations
- Shared Research Tasks
- Quick Dissemination of research Findings and Peer review
- Use of Findings in Standards

# Summary of IHRA Pedestrian Safety WG Activities

Yoshiyuki MIZUNO On behalf of IHRA Pedestrian Safety WG

1

## Contents

- 1.Assignments task to PS/WG
- 2.IHRA PS/WG Members
- 3.IHRA PS/WG Meetings
- 4.Basic Decisions
- 5.IHRA Pedestrian Accidents Data-set
- 6.Study on Passenger Car Front Shape
- 7.Test Procedures
- 8.Future Tasks

## 1. Assignment Tasks to PS/WG

- Investigations and analysis on pedestrian accidents for passenger cars in the IHRA member countries
- Propose Harmonized test procedures to expedite improvements of the vehicle construction that reduce fatal or severe pedestrian injuries in a passenger carpedestrian accidents
- These proposal will be used as the base of future GTR under UN/ECE/WP29/1998 Agreement

### 2. IHRA Pedestrian Safety WG Members

		T 1 0 T 0
Y. MIZUNO (Chairman)	Japan	JASIC
J. McLean	Australia	Adelaide Univ.
E. Janssen	EC	TNO
G. Lawrence	EC	TRL
H. Ishikawa	Japan	JARI
M. Tanahashi	Japan/OICA	JAMA
B. Donnelly	U.S.A.	NHTSA
S. Bilkhu	OICA	AAM
O. Ries	OICA	ACEA
F. Brun-Cassan	OICA	ACEA
H. Ishimaru (Secretary)	Japan	JSAE
1997-2000 M. Bartolo	OICA	AAM
1997-2000 A. Sasaki	OICA	JAMA
1997-2002 J. Provensal	OICA	ACEA
1997-2001 R. Saul	U.S.A.	NHTSA

#### 3. IHRA PS/WG Experts Meeting

```
1st PS/WG Experts Meeting July.
                                   1997
                                          Tokyo.Japan
2<sup>nd</sup> PS/WG
                            March, 1998
                                           Washington D.C., U.S.A
                           September, 1998
3rd PS/WG
                                             Brussels.EC
4th PS/WG
                           February 1999
                                            Adelaide, Australia
5th PS/WG
                           September 1999
                                            Tokyo,Jap an
                                           Washington D.C., U.S.A.
6th PS/WG
                           March 2000
                                           Paris ,EC
7thPS/WG
                           September 2000
8th PS/WG
                           February 2001
                                            Adelaide, Australia
                                   2001
9th PS/WG
                           Mav
                                          Gotemba, Japan
10th PS/WG
                           February 2002
                                           Brussels, EC
11th PS/WG
                                    2002 Washington D.C., U.S.A.
                           June
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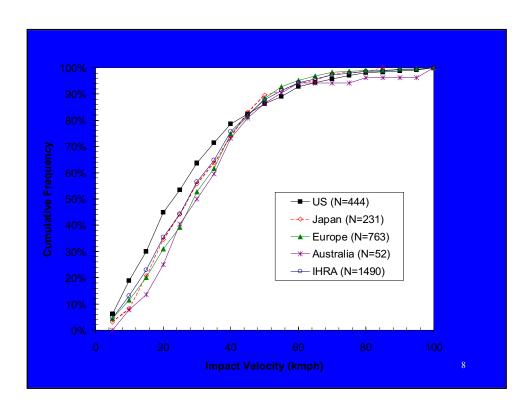
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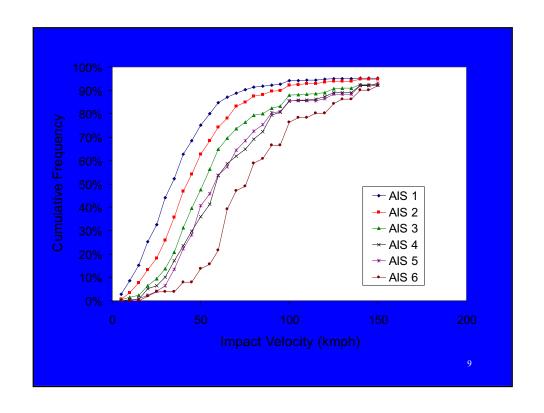
#### 4. Basic Decisions

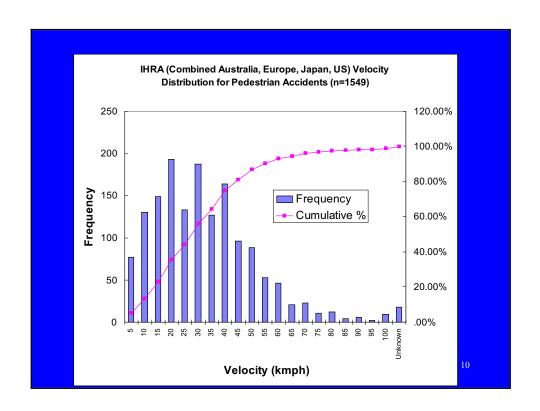
- \* Because it was difficult to develop a pedestrian dummy and because many advantages were confirmed in component tests, it was decide d that component tests be adopted.
- \* Based on the results of detail accident data analysis, the fol lowing priorities were given in the development of various component te sts:
  - (1) Adult/child head test (head vs bonnet/windshield)
- (2) Adult leg test (leg vs bumper)
- (3) Adult chest, abdomen, pelvis/femur tests Child chest, abdomen, pelvis tests
- \*Develop test methods on the basis of (a) existing information a nd expert know-how and (b) the additional studies which will be conducted by volunteers.
- \*Hold WG meetings about two times a year, each meeting lasting f or 3 to 4 days. At the WG meetings, the members will discuss the research results brought by assigned experts and then decide test methods.

### 5. IHRA Pedestrian Accidents Data-set

Age, Impact velocity, Vehicle / Pedestrian interaction, AIS/ Impact velocity relationship for major injury locations are studied.
Result are shown below





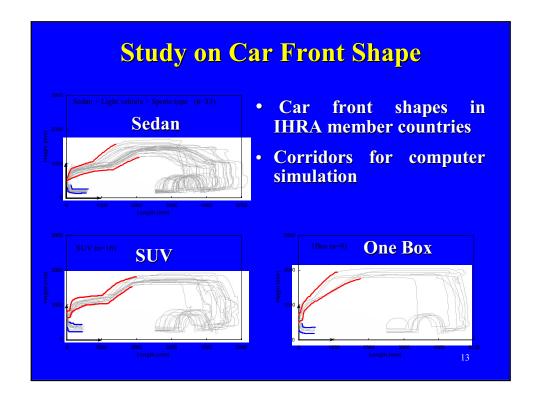


Trust Burger   24   24   16   2   33   5   2   6   50   58   71   458   30		Body Region	Head	Face	Neck	Chest	Abdomen	Pelvis	Arms			Legs			Unkne
Top surface of bounetwing   224   16   2   339   46   44   86   23   3   1   1   2	Contact									Overall	Femur	Knee	Lower Leg	Foot	
Part   Leading edge of Donnariwing   15   2   3   42   79   83   35   58   40   5   28   1		Front Bumper	24	2		3	5	2	6	50	58	71	458	30	1
of the Windscreen glass   347   57   12   30   5   12   23   2   1   1   1   whickle Windscreen frame/ pillum   180   30   4   40   11   19   35   8   1   1		Top surface of bonnet/wing	224	16	2	139	46	44	86	23	3	1	1	2	
Windscreen frame A pillan   180   30   4   40   11   19   35   8   1	Part	Leading edge of bonnet/wing	15	2	3	42	79	83	35	58	40	5	28	1	1
Front Purel:	ofthe	Windscreen glass	347	57	12	30	5	12	23	2			1	1	1
Others	Vehicle	Windscreen frame/A pillars	180	30	4	40	11	19	35	8	1				- 2
Sub-7-total   Size		Front Panel	5	1		9	14	8	6	9	14	11	35	3	
Indirect Contact Improp   13		Others	42	7		37									
Road Surface Contact		Sub-Total	837	115	21	300	171	180	205	167	123	93	560	55	- 6
Unknown   28		Indirect Contact Injury	13		18	2	1	7	1		3		1	2	
Figure 31b. Number of pedestrian injuries related to contact location and body region for Australia, Europe, Japan and the USA (Ages < 16, AIS 2-6)		Road Surface Contact	176	25	2	22	2	9	44	6	4	3	5	15	- 2
Figure 31b, Number of pedestrian figures related to contact location and body region for Australia, Europe, Japan and the USA (Ages < 16, AIS 2-0)    Body Region   Head   Face   Neck   Cheert   Abdomen   Pelvin   Chemistry   Chemist		Unknown	28	4	3	20	14	16	24	2	7	9	32	3	
Body Region   Head   Face   Neck   Chest   Abdomen   Pelvis   Amis   Cornal   Femir   Rice   LowerLeg   Foot		Total	1054	144	44	344	188	212	274	175	137	105	598	75	- 1
Proof Bumper   S		Figure 31b. Number of pedestrian inj	uries relate	d to conta	act locatio	n and bod	y region for Au	stralia, Euro	ope, Japan	and the US	A (Ages <	16, AIS	2-6)		
Print Bamper   5	/	Body Region	Head	Face	Neck	Chest	Abdomen	Pelvis	Arms			Legs			Unk
Front Bumper   S	Contact									Overall	Femur	Knee	Lower Leg	Foot	
Top surface of bounds/wing	Demion	Front Bumper	5			1	3		3	27	19	5	45	1	
Part   Leading edge of Demonstraing   11   1   2   3   11   5   8   3   11   1   6		Top surface of bonnet/wing	78	9	1	12	6	2	15	1	1				
of the Windscreen glass   40   2   1   1   2   2	Part											1	6		
Website   Windsteren frame/A pillare   13   1   3   1   1   4   4   5   1   1   5   5			40	2					2						
Front Pinel	Vehicle						1	1		4					
Others								1	1		5	1	1		
Indisect Contact Injury   1							1		2	4			13	5	
Indisect Contact Injury   1		Sub-Total	161	13	4	25	22	9	35	39	40	7	65	6	
Road Surface Contact					1		1		1						
Unknown   6				8		1		1		6				1	
Total   216   21   6   27   26   10   57   45   41   7   69   7											3		4		
Body Region   Head   Face   Neck   Chest   Abdomen   Pelvis   Arms   Legs   Unknown   Contact				21	6	27		10	57	45	43	7	69	7	
Front Disease   19   2   2   2   2   3   23   39   66   413   29	Contact											Legs		Foot	Unkn
Top surface of bounds wing   146   7   1   127   40   42   71   22   2   1   1   2	LACUATO II	Front Bumper	19	2		2	2	2	3	23	39	66	413	29	
Part   Leading edge of Demonstrwing   4   1   1   39   68   78   27   55   29   4   22   1					1										
of the Windscreen flams         307         55         11         29         5         12         21         2         1         1         1         1         1         29         4         37         10         18         31         4         1         1         8         14         7         5         9         9         10         34         3           Others         33         7         33         10         12         12         21         3         5         24         13           Sub-Yotal         676         102         17         275         149         171         170         128         83         86         495         49           Indirect Context limity         12         17         2         7         3         1         2           Road Surface Context         128         17         1         21         1         8         26         0         4         3         5         14           Utiknown         22         4         3         19         12         16         19         2         4         9         28         3	Part														
Webscle         Windscreen Fame/A pillars         167         29         4         37         10         18         31         4         1         8         14         7         5         9         9         10         34         3           Others         33         7         23         10         12         12         12         13         3         5         24         13           Mobilered Cuntac Harry         13         102         17         225         149         17         170         128         83         86         469         49           Indistructionary         12         17         2         1         7         2         1         1         2         1         1         2         1         1         2         1         1         2         1         1         2         1         2         1         3         3         1         2         1         2         1         2         2         3         3         1         2         2         3         3         5         3         3         3         5         3         3         5         3         3         5	of the														
Front Panel   1   8   14   7   5   9   9   10   34   3	Vehicle										1				- 2
Others   33   7   33   10   12   12   13   3   5   24   13												10	34	3	
Sub-Year   Grid   102   17   275   149   171   170   128   81   86   495   49   186   187   18			33												
Indirect Contact Injury   12   17   2   7   3   1   2     2     3     3   1   2     3     3   1   2     3     3     3     3   1   2     3					17										
Road Surface Contact 128 17 1 21 1 8 28 0 4 3 5 14 1 Unknown 22 4 3 19 12 16 19 2 4 9 28 3				,02					- 710	-20		- 30			
Unknown 22 4 3 19 12 16 19 2 4 9 28 3				17			1		28	0		3			

### 6. Study on Passenger Car Front Shape

US, European and Japanese passenger car front shapes are collected from OICA members

Front Shape of Sedans, SUVs, One Boxes will be shown in this Chapter



#### 7. Test Procedures

7-1 Adult/Child Head Test Procedures for Bonnet and Windshield

- \* Adopt component tests.
- \* Scope

The collisions of the adult's and the child's heads with the bon net and windshield of a passenger car.

\* Impactors

Select the head of a 6-year-old as impactor model, since child-car accidents peak with 6-year-olds.

Use a AM50 percentile head for adults.

Development of hemispherical impactors underway on the basis of:

Child 3.5 kg 165 mm diameter

Adult 4.5 kg 165 mm diameter

Follow up with examination into impactor specification details and calibration/certification test methods.

\* Categorization of applicable vehicles

Domestic information of member countries supported by OICA members collected on three categories of passenger cars (sedans, SUVs, one-boxes).

- \*Impact speed
- Propose feasible test methods assuming a pedestrian -passenger car impact speed within a 30-50 km/h range.
- \*Impact zones of adult/child impactors
  - From the accident data of IHRA member countries, the impact zone is set at WAD 900-1,700 mm for the child impactor and WAD 1,400-2,400 mm for the adult impactor; the adult/child overlap area is 1,400-1,700 mm. While discussion is underway for adoption of the overlap test method, JARI's study indicates there is no big difference in the life saving rate between overlap and boundary test methods.
- \*Computer simulation
- Using their respective mathematical models for the analysis of pedestrian-passenger car collisions, NHTSA (U.S.), JARI (Japan) and RARU (Australia) conducted computer simulations on the basis of vehicle shape and other agreed basic parameters. Parameters are pedestrian size (2), walking position (3), vehicle shape (3X3), vehicle stiffness (2), vehicle crash speed (3), braking (1) and others.
- But the simulation results diverged widely among the three institutes' analysis. The basic specifications were therefore modified, and the second simulation is now underway.

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#### 7-2 Leg Test Procedures

- \*Discussion on this subject was started recently.
- \*Efforts are being made to collect existing information and expert know-how regarding the following matters:

Detailed accident information

Biomechanical data (injury mechanism and its tolerance)

Information on leg impactors and pedestrian dummies concerning their shortcomings and necessary improvements Evaluation of component/full tests

On the basis of the above information collected, the research tasks, work assignments and time schedule will be finalized.

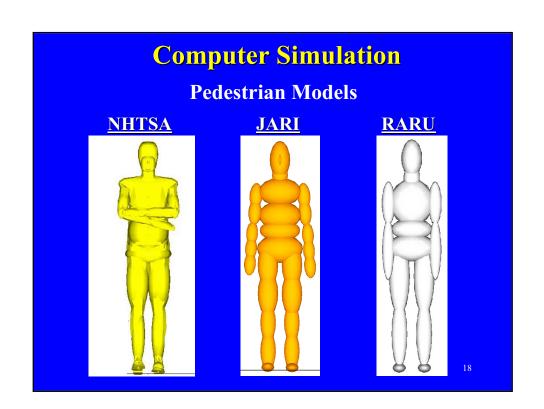
\*Impact speed

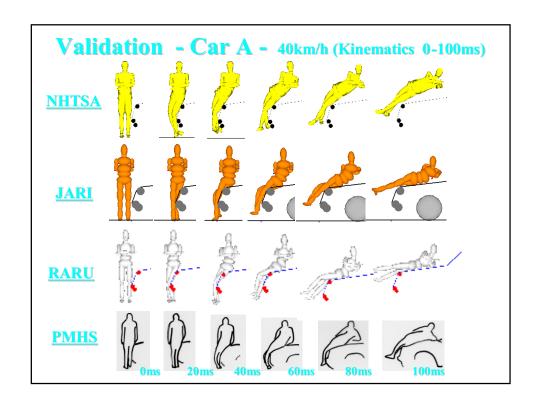
Assume a pedestrian-passenger car impact speed between 30 and 50 km/h in conformity with the head component test.

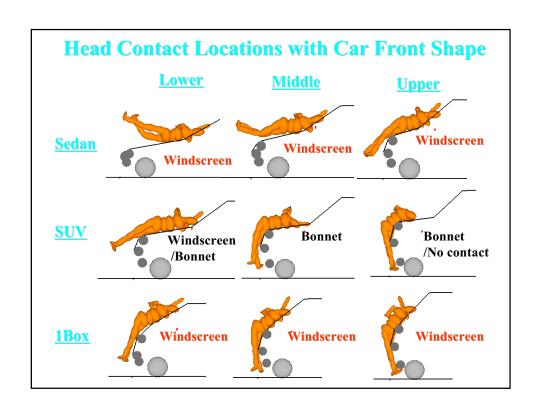
\*All tasks will be completed by the end of 2005.

## **Computer Simulation**

- Head Impact Speed / Vehicle Impact Speed
- Head Impact Angle
- Head Effective Mass / Head Mass
- WAD / Pedestrian Height







## **Computer Simulation Results**

	Head Impact Speed/In	ıpact Speed
	Bonnet	Windscreen
Sedan	$(0.81\pm0.17)$	$(1.06\pm0.13)$
SUV	$(0.71\pm0.21)$	$(0.96\pm0.07)$
One-Box	no contact	(0.68±0.21)
	Head Impact Angle (wit	h horizontal)
	Bonnet	Windscreen
Sedan	$(60.6\pm14.4)$	(43.5±7.9)
SUV	$(77.9\pm19.3)$	$(68.5\pm7.5)$
One-Box	no contact	(45.1±9.5)
	Head Effective Mass/A	Actual Mass
	Bonnet	Windscreen
Sedan	$(1.01\pm0.13)$	$((0.79\pm0.23)$
SUV	$(0.99\pm0.35)$	$(0.84\pm0.20)$
One-Box	no contact	$(0.76\pm0.30)$

#### 8. Future Tasks (New Terms of Reference)

Adult: 4.5 kg

- 8-1 Pedestrian Head Impact Test Methods (Adult, Child) by mid of 2003 ]
- The main portions of the test methods are scheduled to be decide d by June 2001 excluded impact conditions. The remaining details need to be finalized in the following months.
- Specifically,
- Test will be performed to evaluate the biofidelity, durability, reproducibility, inertia moment, etc. of the new head -form impactors
- Through actual testing, the details of certification test proced ures will be verified
- Conduct technical feasibility study and reflect such result to t he test procedures.
- Computer simulation and validation [by mid o f 2003]
- Obtain improved PMHS data and additional accident data, and improved model/validation, for example, sensitivity study (car stiffness, stance, statue, etc), simulation other statues (small, large child; small, large adult)

#### 8-2 Adult Leg Test Method

### [ by mid of 2005 ]

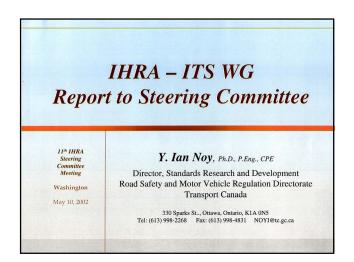
- WG will be considered not only subsystem test method but also ot her test method [by end of 2003]
- Biomechanical data will be collected and analyzed concerning the pedestrian injury mechanism, human tolerance, etc. in the speed range of 30-50 Km/h.
   [by end of 2002]
- From such biomechanical data, measurement items and levels will be determined for the test procedure. [by end of 2002]
- Judgement will be made on the existence of an impactor satisfying the specified measurement items and levels [by m id of 2003]
- If an appropriate impactor does not exist, an existing one will be improved or a new one will be developed.
- In this case, a volunteer country(s) will be selected and the sc hedule for such impactor improvement or development will be set [by mid of 2003]
- In the development of a new test method, the portions of the exi sting component test which are adaptable or not adaptable to the new t est method will be identified, and the development effort will be fo cused on the unacceptable portions.
- Conduct technical feasibility study and reflect such result to t he test procedures [by mid of 2005]

### 8-3 Establishment of Test Methods for Other Important Body Regions [?]

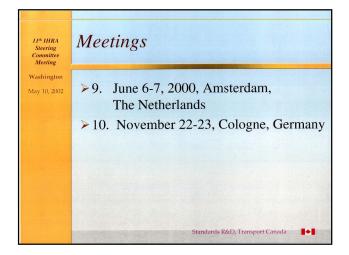
- The previous priority ranking will be checked, and about one or two body regions will be selected and establish work plan [by mid of 2003]
- Volunteer countries, their work assignments, deadlines, etc.
   will be decided and the development work will be initiated

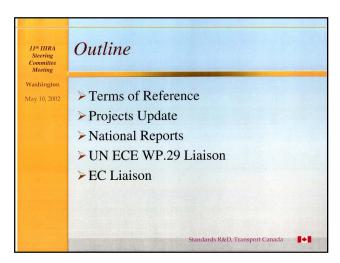
## 8-4 Computer simulation [by mid of 2005]

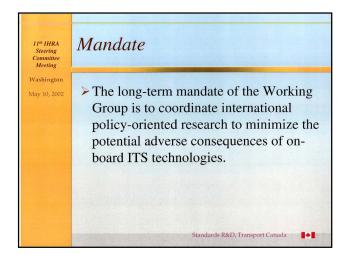
 Study how far we can use computer simulation study for test procedure, also check the limitation of computer simulation study.

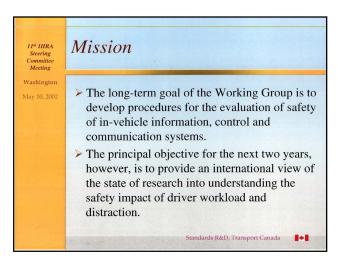


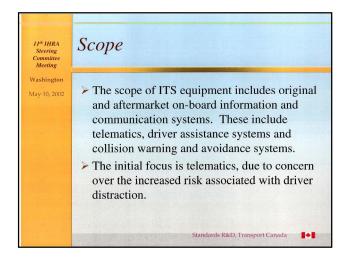


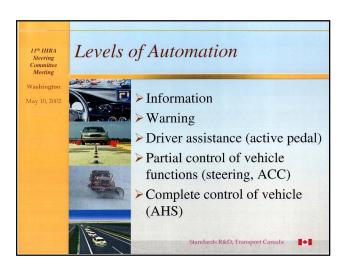


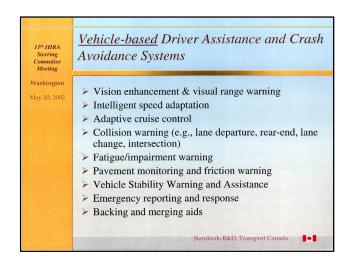


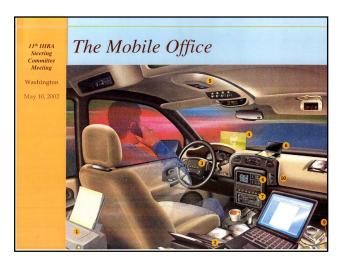


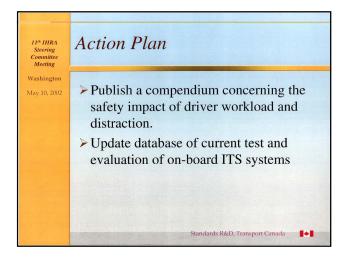


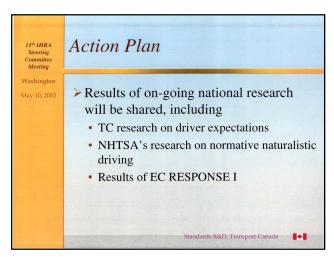


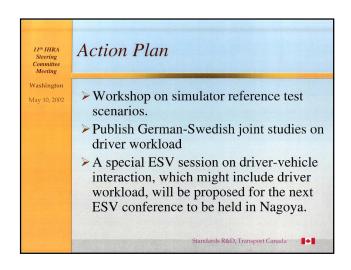


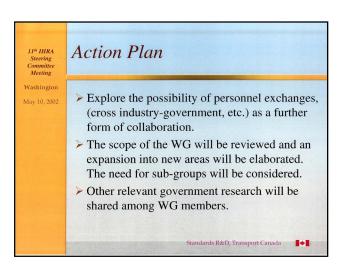


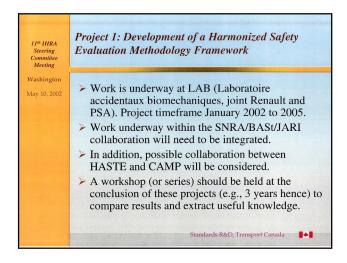


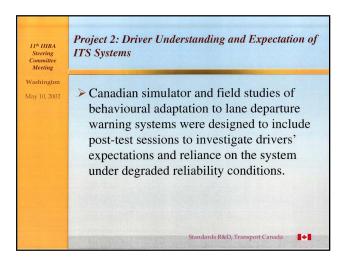


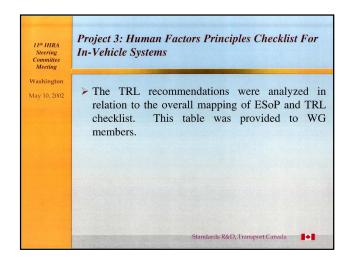


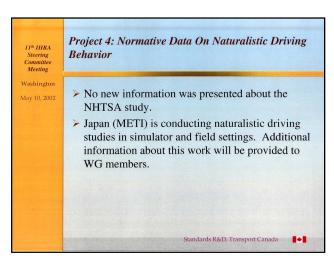


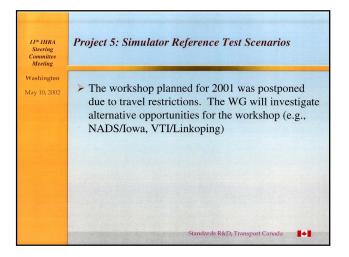


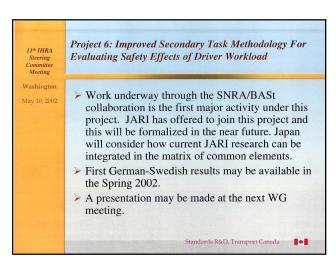


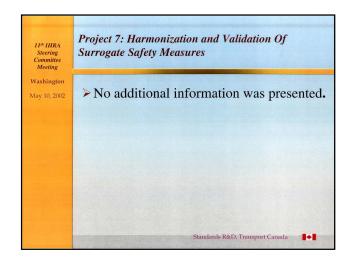


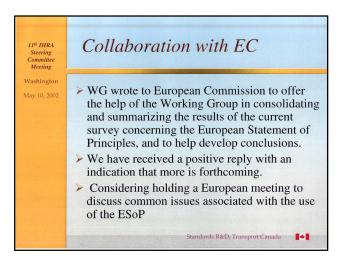


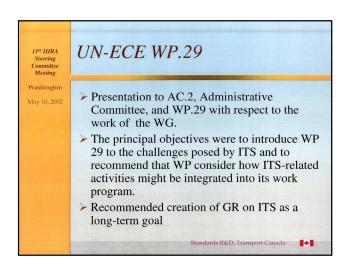


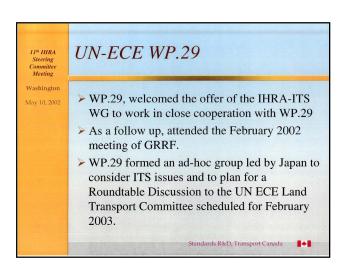














Event data recorders are installed on many late-model cars and light trucks as an adjunct to air bag sensing and control systems. Some heavy trucks and buses are also equipped with on-board data recorders. Research has suggested that these devices provide a valuable new source of collision data, enabling a better understanding of many traffic safety issues, and affording an opportunity for the development of new and effective countermeasures.

It is important to note that access to data captured by on-board recording systems may be the only means by which the performance of complex vehicle control systems, such as advanced occupant restraints and yaw stability systems, can be properly evaluated. The stored data can confirm when systems function as designed, and can also identify system deficiencies. Careful analysis of such results can be used to drive design improvements, and assure the safety of specific devices through the development of appropriate regulations.

A major limiting factor in the utility of data currently captured by on-board recorders is the wide diversity and capabilities of individual systems. In particular, there is no standardization as to the nature of the data that are recorded, the format in which information is stored, or the means by which data can be retrieved. In fact, the data format and data retrieval tools are generally proprietary to any given motor vehicle manufacturer. For the data to be fully utilized, and the potential safety benefits realized, it will be necessary to resolve these issues through the development of appropriate standards, recommended practices, or regulations.

Preliminary findings from an ad-hoc working group established by the US National Highway Safety Administration have suggested a need to expand the range of variables which might usefully be captured by future data recorders and, in particular, the need to address issues related to standardization, data retrieval and privacy.

Additional research into these and other issues will be necessary to promote the widespread availability and use of data from on-board crash recorders. In particular, potential applications of the resulting information need to be explored, and an assessment undertaken of the safety benefits which may accrue from such use of the data.

Since these and other similar issues are relevant to governments and industry in a number of countries, there is an opportunity for further research and development activities relating to event data recorders to be conducted as a cooperative venture through IHRA. It is proposed, therefore, to establish an Event Data Recorder Working Group to undertake this task.

#### **Update (May, 2002)**

#### Development of Future Standards

Three standards-making bodies currently have work in progress on future standards for event data recorders:

International Organization for Standardization (ISO): The Traffic Accident Analysis Methodology working group (ISO/TC 22/SC12/WG 7) has proposed a work item to establish a standard relating to crash severity measures which should be captured by EDRs.

Society of Automotive Engineers (SAE): The Accident Investigation and Reconstruction Practices Committee (AIRP) has established a Task Group to develop a recommended practice relating to EDRs.

*Institute of Electrical and Electronic Engineers (IEEE):* A working group (Project 1616) has been established to develop a standard for EDRs.

#### Research Needs

The work of the above-noted committees in drafting standards and recommended practices could be enhanced by research to identify the specific data elements which would provide useful objective data on various types of collisions, and to quantify the precise parameters which should be recorded to appropriately describe a given crash event. An additional issue would be to conduct research to establish appropriate levels of ruggedness for EDRs, their ancillary power supplies and circuitry, so that these systems are able to withstand the forces of collision and maintain a data record.

Research, based on records from EDRs which are present in the current vehicle fleet, could be conducted to evaluate the utility of the available data for a variety of likely end uses. For example, pre-crash data could be used to identify specific causal factors in real-world crashes, collision severity data could be correlated to injury outcomes in order to obtain better understanding of injury tolerance levels, and the recorded performance of advanced seat belt and air bag systems could be evaluated in specific collision circumstances. Such research would identify if the objective data provided by EDR systems could be used effectively to develop a range of countermeasures to provide improved safety.

The applicability of the resulting data to the development of improved road and motor vehicle safety regulations might also be explored. For example, could a library of crash pulses captured by in-vehicle EDRs be used to define more appropriate crash test procedures, better reflecting the real-world collision environment? Would these same data provide a means to evaluate and improve the performance of crash attenuation systems deployed in relation to the highway infrastructure? Do the data provide a means

of identifying defects in the design and function of critical control systems on vehicles which are equipped with sophisticated technological devices, and can they be used to effect corrective action?